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TRANSLATION

ONE MORE PORTRAIT OF THE MOON

BY

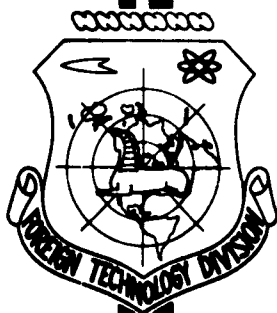
L. Strizhevskaya

FOREIGN TECHNOLOGY DIVISION

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ONE MORE PORTRAIT OF THE MOON

by

L. Strizhevskaya

Not long ago at the main Pulkovo observatory the astrophysicist N. P. Kuprevich with the aid of an infrared television apparatus obtained a unique photograph of the moon. The mastery of the photography of celestial bodies in the infrared part of the spectrum opens up new prospects in the study of the craters on the moon's surface.

Without the least hesitation anybody on looking at this photograph would recognize the natural satellite of our earth--the moon. Yes, as if it were the most ordinary photograph of the moon, such as we are accustomed to see in our textbooks ... But why then do astronomer-specialists examine this photograph?

With the investigation of the moon mankind links up great hope for learning the history of the formation of the planets of the solar system, and above all of our earth. On the moon, apparently, everything has remained untouched since the formation of its features. Aside from the consideration of the falling of meteors its surface has not been subjected to the action of atmosphere and water, and apparently has maintained its original characteristics.

Before man sets foot on the surface of the moon the scientists are obliged to obtain the most precise information about our natural satellite. The first thing that proves to be essential is the obtaining of a most detailed map of the lunar surface. At the present time, thanks to the powerful telescopes, there do not remain on the visible side of the moon regions with an area greater than two square kilometers that have not been recorded in the atlases. The overall number of "details" of the lunar surface known to the astronomers now reaches 35 thousand. In order to work all their names in on

the map it was necessary to draw out the dimensions of one of the most precise atlases to over seven meters.

However, the astronomers are still unsatisfied. Up to the present time one does not know the structure of the relief of some areas of the lunar surface the linear dimensions of which exceed thousands (!) of kilometers.

How can this be so! is it possible/ telescopes, capable of distinguishing regions with the area of an athletic stadium, are powerless to make out the structure of the giant formations. Yes, telescopes sometimes really prove to be powerless. The instability of the atmosphere now limits the use of the superpowerful telescopes. The images of the celestial bodies through such telescopes look diffused and unsteady.

After field glasses and telescopes began to be used the astronomers discovered around a number of craters of the moon diverging flashing rays. The brightness of these rays at the Crater Tycho is so strong that even now on looking at them in the largest telescopes the astronomers come out with conflicting hypotheses. What are these, mountain chains

The moon as we see it - or filled-up embankments? Up to this time the nature of the lunar rays has remained an enigma. How were they formed? How does one explain the great extension of the rays?

The key to the solution of the lunar puzzle may be furnished by deciphering photographs of the moon, such as are shown here in our paper. This photograph was made in infrared rays, which are not visible to the human eye. For a long time already astronomers have given attention to the remarkable properties of infrared rays. In contrast to visible light waves, part of the infrared rays--waves of much greater length than those of the visible part of the spectrum--are capable of piercing through fog and dense layers of the atmosphere, practically without being absorbed.

When the astronomers some years ago took up photographing celestial bodies in infrared rays their equipment consisted of telescopes, photographic apparatuses, and photographic plates. However, the first photographs of the moon in infrared rays brought disappointment, although they brought something new in knowledge of the moon. The trouble is that the sensitivity of the photographic material to infrared rays is extremely low. This is a serious obstacle in the technology of the photographing of celestial bodies. It turned out that the new direction of astronomy soon ran into a blind alley.

But now in the spring of 1962 in Pulkovo a new solution was found. In one of the laboratories astrophysicist Nikolay Fedorovich Kuprevich has been busying himself with researches of the surface of the moon for a long time. To an outsider many things in his laboratory will seem unusual. No telescope is seen in the laboratory; as if it were a superfluous object it is put out on the balcony. All of the astronomical observations are carried on deep in the room, where on the laboratory table astronomical instruments are arranged at all, but radio parts, television tubes, and electronic equipment.

"The photograph which I am showing you," said Nikolay Fedorovich Kuprevich, "was taken in infrared rays in the range 0.9--2.3 microns, but not

directly on a photographic plate, instead with an intermediate converter of invisible red rays into visible rays. The role of converter was taken by

a television apparatus.

The image of the moon amplified with the aid of a telescope is directed not onto a photographic plate, but onto a television pick-up sensitive to infrared rays. All observations can now be transferred to a television screen located at any distance from the telescope.

Picture of the moon in infrared rays

What does this mean?

We can amplify the image of the moon in the infrared part of the spectrum, and make the photograph brighter with more contrast. As a result one gets a better quality of image. Now already, the first trial photographs using a telescope even of moderate dimensions provided through the television setup enable one to introduce corrections into the atlases which were composed using huge telescopes.

On the photograph of the moon obtained in the ordinary way we can observe bright rays diverging from the Crater Tycho. On the photograph, however, in the infrared part of the spectrum the rays turn into ordinary mountain chains. How can one explain this?

Scientists suggest that the glitter of the lunar rays are brought about by a luminescence or glow of the lunar rocks under the action of the ultravi-

olet radiation of the sun. Under earth conditions the ultraviolet radiation of the sun is practically all absorbed in the atmosphere and does not reach us.

It is a different situation on the moon where there is no air. The action of the ultraviolet rays there is so powerful that some of the lunar rocks, cinders, and sands visibly begin to luminesce just like the special colors of advertisements illuminated in the windows of the stores. This brilliance in the visible part of the spectrum is so strong that it blinds the human eye and the photographic plate. But in the infrared rays this "mysterious" brilliance disappears; everything becomes clear as in the palm of your

What will the first man meet with when he steps out on the surface of the moon? At which point on the moon is it feasible to set down the spaceship?

Science, doubtless, will find the answers to these questions.

In all such predeterminations a very important role is assigned to the technical media with which the astronomers operate. The development in each new direction in the hands of the scientists is one more little key in the unraveling of the secrets of the universe. And among the many scientific discoveries the mastery of the photographing of celestial bodies with the aid of infrared-television technology is a new accomplishment of Soviet science.

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